



DOCKET NO. 216527US0PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Kenji MASUI et al

INVENTOR: 10/019,427

GROUP ART UNIT: 1761

FILED: December 31, 2001

FOR: WATER-IN-OIL TYPE EMULSIFIED FAT AND/OR OIL COMPOSITION

RECEIVED  
JUL 22 2003  
GROUP 1700

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

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SIR:

Applicants wish to disclose the following information.

**REFERENCES**

- ☐ The Applicant(s) wish to make of record the references listed on the attached Form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

**RELATED CASES**

- ☒ Attached is a list of Applicants' pending applications or issued patents which may be related to the present application. A copy of the patents, together with a copy of the claims and drawings of the pending applications is attached along with Form PTO-1449.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

**CERTIFICATION**

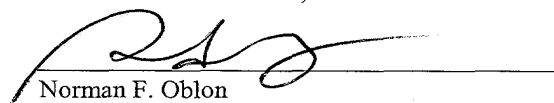
- ☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- ☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

**DEPOSIT ACCOUNT**

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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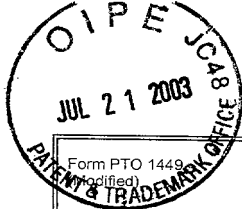


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Form PTO 1449  
(modified)U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE

ATTY DOCKET NO.

216527US0PCT

SERIAL NO.

10/019,427

LIST OF REFERENCES CITED BY APPLICANT

APPLICANT

Kenji MASUI et al

FILING DATE

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GROUP

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GROUP 1700

## U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	6,022,579	02/08/00	Hideki MORI et al			
	AB	6,495,536	12/17/02	Kenji MASUI et al			
	AC	6,448,292	09/10/02	Shin KOIKE et al			
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						
	AL						
	AM						
	AN						

## FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION	
					YES	NO
	AO					
	AP					
	AQ					
	AR					
	AS					
	AT					
	AU					
	AV					

## OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	
	AX	
	AY	
	AZ	

☐ Additional References sheet(s) attached

Examiner

Date Considered

\*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



### LIST OF RELATED CASES

<u>Docket Number</u>	<u>Serial or Patent Number</u>	<u>Filing or Issue Date</u>	<u>Inventor/ Applicant</u>
0327-0701-0	6,022,579	02/08/00	MORI, et al.
216527US0 PCT*	10/019,427	12/31/01	MASUI, et al.
216537US0 PCT	10/009,494	04/08/02	MASUI, et al.
216743US0 PCT	09/926,741	12/11/01	KAWAI, et al.
217788US0 CONT	10/032,493	01/02/02	KOIKE, et al.
218107US0 CONT	10/061,286	02/04/02	KOIKE, et al.
0327-0800-0	6,495,536	12/17/02	MASUI, et al.
204724US0	6,448,292	09/10/02	KOIKE, et al.
210796US0	09/900,053	07/09/01	SUGIURA, et al.
233632US0 PCT	10/343,742	02/06/03	KOIKE, et al.
209821US0	09/907,811	07/19/01	NAKAJIMA, et al.
215291US0	09/985,755	11/06/01	KUDO, et al.
217199US0	10/014,356	12/14/01	KAWAI, et al.
220182US0	10/101,606	03/21/02	KATAOKA, et al.
220446US0	10/101,607	03/21/02	SUZUKI, et al.
221534US0	10/132,504	04/26/02	KOIKE, et al.
221050US0	10/120,514	04/12/02	SAKAI, et al.
223858US0	10/166,687	06/12/02	KOMATSU, et al.
233628US0 PCT	10/343,748	02/06/03	KOIKE, et al.
233619US0 PCT	10/343,831	02/10/03	KOIKE, et al.

\*Present Application; listed for information

215763US0 CONT	10/014,449	12/14/01	SAKAI, et al.
219028US0 CONT	10/083,387	02/27/02	SAKAI, et al.
222502US0	10/131,188	04/25/02	HASE, et al.
228876US0	10/259,615	09/30/02	SAKAI, et al.
228320US0 DIV	10/244,736	09/17/02	MASUI, et al.
228077US0 CIP	10/238,720	09/11/02	HASE, et al.

\*Present Application; listed for information

216537

CLAIMS

1, An water-in-oil type emulsified fat and/or oil composition which is composed of (1) the oil phase comprising 35 to 95 % by weight, based on the total oils and fats, of a diglyceride(s) having its increasing melting point of lower than 20 °C and the balance of triglycerides having fatty acid parts comprising 13 to 60 % by weight of palmitic acid and 5 % by weight or less of fatty acids having 12 or less carbon atoms, polymorph of the triglycerides being stable in the form of  $\beta'$  and (2) the aqueous phase based on water.

2, The water-in-oil type emulsified fat and/or oil composition as claimed in Claim 1, wherein a ratio of palmitic acid, stearic acid and an unsaturated fatty acid having 16 or more carbon atoms among fatty acids constituting triglycerides is in the range surrounded by points A (13, 2, 85), B (13, 57, 30), C (60, 10, 30) and D (60, 2, 38) in the triangular chart in Fig. 1.

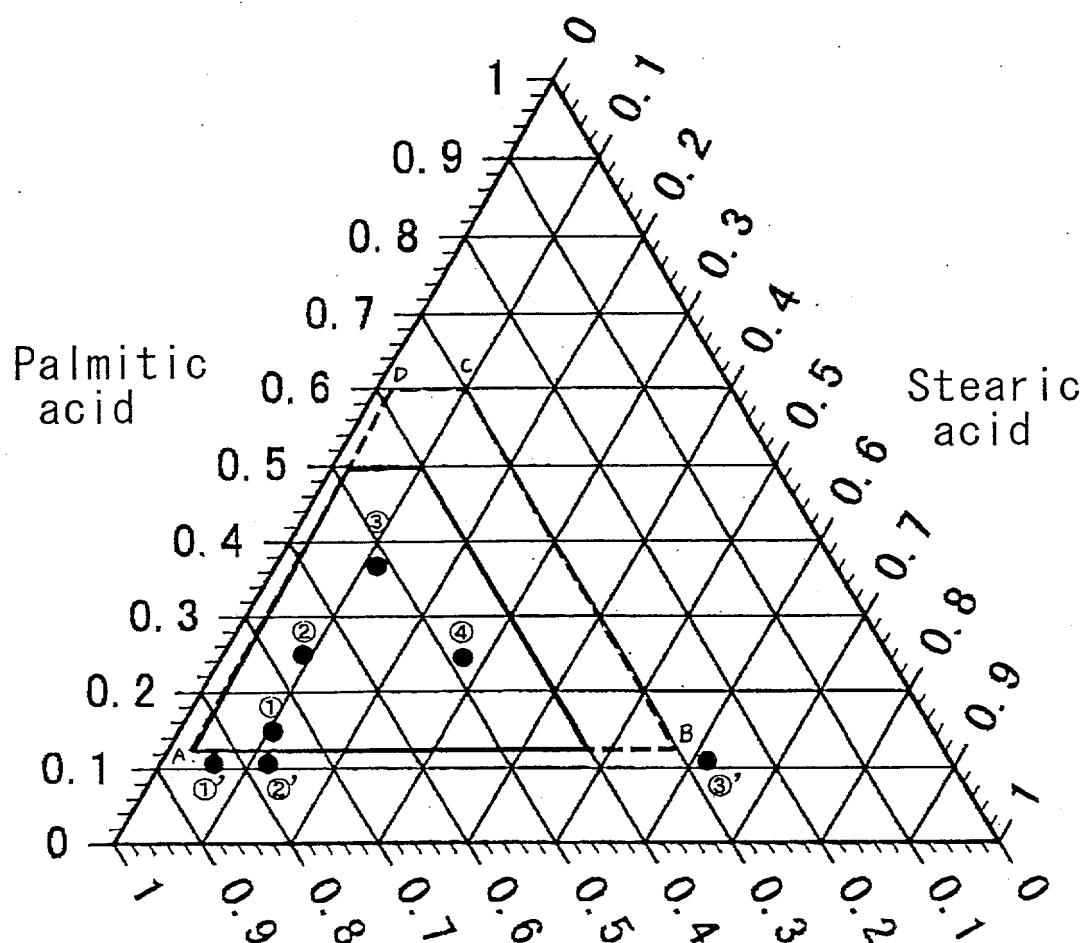
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Related Pending Application
Related Case Serial No: 40/009,494
Related Case Filing Date: 04/08/02

## ABSTRACT

The present invention provides a water-in-oil type emulsified fat and/or oil composition of which emulsification is stable in spite of containing a high content of water and which is excellent during storage in physical properties and feeling on eating. That is, the present invention provides an water-in-oil type emulsified oil and/or fat composition which is composed of (1) the oil phase comprising 35 to 95 % by weight, based on the total oils and fats, of a diglyceride(s) having its increasing melting point of lower than 20 C° and the balance of triglycerides having fatty acid parts comprising 13 to 60 % by weight of palmitic acid and 5 % by weight or less of fatty acids having 12 or less carbon atoms, polymorph of the triglycerides being stable in the form of  $\beta'$  and (2) the aqueous phase based on water.

Fig. 1



An unsaturated fatty acid  
having 16 or more carbon atoms

## CLAIMS

1. An acid oil-in-water emulsified composition comprising an oil phase having a diglyceride content of 30 wt.% or greater and a yolk, wherein a ratio of lysophospholipids to the whole phospholipids is at least 25% in terms of a phosphorus amount.
2. An acid oil-in-water emulsified composition according to claim 1, wherein a part or whole of the lysophospholipids are derived from a yolk.
3. An acid oil-in-water emulsified composition according to claim 1 or 2, wherein a part or whole of the lysophospholipids are derived from an enzyme-treated yolk.
4. An acid oil-in-water emulsified composition according to claim 3, wherein the enzyme is selected from esterase, lipase or phospholipase A.
5. An acid oil-in-water emulsified composition according to any one of claims 1 to 4, further comprising a phytosterol.
6. An acid oil-in-water emulsified composition according to any one of claims 1 to 5, which is a dressing.
7. An acid oil-in-water emulsified composition according to any one of claims 1 to 5, which is a mayonnaise.

Related Pending Application

Related Case Serial No: 09/926,741

Related Case Filing Date: 12/11/01



## ABSTRACT

Described is an acid oil-in-water emulsified composition comprising an oil phase having a diglycerides content of 30 wt.% or greater and a yolk, wherein a ratio of lysophospholipids to the whole phospholipids is at least 15% in terms of a phosphorus amount. The composition has excellent storage stability, appearance, taste and physical properties even if it contains diglycerides in a high concentration without decreasing the amount of the yolk.

## CLAIMS

1. An oil composition comprising 0.1 to 59.8% by weight of a triglyceride, 40 to 99.7% by weight of a diglyceride, 0.1 to 10% by weight of a monoglyceride and at most 5% by weight of a free fatty acid, wherein contents of  $\omega 3$  type unsaturated acyl groups having at least 20 carbon atoms and monoenoic acyl groups in acyl groups constituting the diglyceride are 15 to 89.5% by weight and 10 to 84.5% by weight, respectively.

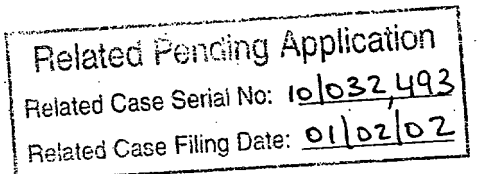
2. The oil composition according to Claim 1, which further comprises 0.1 to 10% by weight of a glyceride polymer.

3. The oil composition according to Claim 1 or 2, wherein the content of  $\omega 6$  type unsaturated acyl groups in acyl groups constituting the diglyceride is 0.5 to 75% by weight.

4. An oral medicinal composition comprising the oil composition according to any one of Claims 1 to 3.

5. A food comprising the oil composition according to any one of Claims 1 to 3.

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## ABSTRACT

The invention relates to oil composition comprising 0.1 to 59.8% by weight of a triglyceride, 40 to 99.7% by weight of a diglyceride, 0.1 to 10% by weight of a monoglyceride and at most 5% by weight of a free fatty acid, wherein contents of  $\omega$ 3 type unsaturated acyl groups having at least 20 carbon atoms and monoenoic acyl groups in acyl groups constituting the diglyceride are 15 to 89.5% by weight and 10 to 84.5% by weight, respectively; and oral medicinal compositions and foods comprising such an oil composition.

The oil composition effectively develops physiological functions derived from  $\omega$ 3 type unsaturated fatty acids, such as inhibition of platelet aggregation, and is excellent in effect of facilitating combustion of body fat, oxidation stability, flavor and the like, and also excellent in flowability.

CLAIMS

1. An oil composition comprising 0.1 to 59.8% by weight of a triglyceride, 40 to 99.7% by weight of a diglyceride, 0.1 to 10% by weight of a monoglyceride and at most 5% by weight of a free fatty acid, wherein contents of  $\omega$ 3 type unsaturated acyl groups having at least 20 carbon atoms and monoenoic acyl groups in acyl groups constituting the diglyceride are 15 to 89.5% by weight and 10 to 84.5% by weight, respectively.

2. The oil composition according to Claim 1, which further comprises 0.1 to 10% by weight of a glyceride polymer.

3. The oil composition according to Claim 1 or 2, wherein the content of  $\omega$ 6 type unsaturated acyl groups in acyl groups constituting the diglyceride is 0.5 to 75% by weight.

4. An oral medicinal composition comprising the oil composition according to any one of Claims 1 to 3.

5. A food comprising the oil composition according to any one of Claims 1 to 3.

Related Pending Application
Related Case Serial No: 10/061,286
Related Case Filing Date: 02/04/02

## ABSTRACT

The invention relates to oil composition comprising 0.1 to 59.8% by weight of a triglyceride, 40 to 99.7% by weight of a diglyceride, 0.1 to 10% by weight of a monoglyceride and at most 5% by weight of a free fatty acid, wherein contents of  $\omega$ 3 type unsaturated acyl groups having at least 20 carbon atoms and monoenoic acyl groups in acyl groups constituting the diglyceride are 15 to 89.5% by weight and 10 to 84.5% by weight, respectively; and oral medicinal compositions and foods comprising such an oil composition.

The oil composition effectively develops physiological functions derived from  $\omega$ 3 type unsaturated fatty acids, such as inhibition of platelet aggregation, and is excellent in effect of facilitating combustion of body fat, oxidation stability, flavor and the like, and also excellent in flowability.

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Claims:

1. A process for fractionating an oil composition containing at least 50% by weight of partial glycerides into a solid portion and a liquid portion, which comprises dissolving an emulsifier in the oil composition, cooling the solution to deposit crystals and then conducting solid-liquid separation.
2. The process according to Claim 1, wherein the content of acyl groups derived from palmitic acid and stearic acid in all the acyl groups of the oil composition is at most 20% in total.
3. The process according to Claim 1 or 2, wherein the emulsifier is a polyol fatty acid ester.
4. The process according to Claim 3, wherein the polyol fatty acid preferably has an HLB of at most 7 and a melting point of 20 to 40°C.
5. The process according to Claim 3 or 4, wherein the melting point of the polyol fatty acid ester is higher by 3 to 25°C than that of the oil composition containing at least 50% of the partial glycerides.
6. The process according to any one of Claims 3 to

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5, wherein the acyl groups of the polyol fatty acid ester are mixed acyl groups having 12 to 18 carbon atoms, and the content of acyl groups having less than 12 carbon atoms is at most 1% based on all the constitutive acyl groups of the polyol fatty acid ester.

7. The process according to any one of Claims 3 to 6, wherein the polyol fatty acid ester is a polyglycerol fatty acid ester.

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## ABSTRACT

A process for fractionating an oil composition containing at least 50% by weight of partial diglycerides into a solid portion and a liquid portion, which includes  
5 dissolving an emulsifier in the oil composition, cooling the solution to deposit crystals and then conducting solid-liquid separation. The process permits easily fractionating the oil composition into a solid oil  
10 composition and a liquid oil composition.



CLAIMS

1. An oil/fat composition comprising 5 to 99.9 wt.% of a monoglyceride having, as a fatty acid constituent thereof, 15 to 90 wt.% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms, 1 to 80 wt.% of an  $\omega$  9-unsaturated fatty acid and 2 to 50 wt.% of an  $\omega$  6-unsaturated fatty acid; and 0.1 to 49.9% of a diglyceride, wherein the weight ratio of the diglyceride to the monoglyceride is less than 1 and the content of polyunsaturated fatty acid having at least 4 carbon-to-carbon double bonds is 20 wt.% or less of all the fatty acid constituents.
2. An oil/fat composition according to claim 1, which has a POV of 10 or less and contains  $\alpha$  -linolenic acid as the  $\omega$  3-unsaturated fatty acid.
3. An oil/fat composition according to claim 1 or 2, which has a POV of 3 or less, has a color (10R + Y) of 30 or less, comprises 60 to 99.5 wt.% of the monoglyceride, 0.5 to 10 wt.% of the diglyceride, 39.5 wt.% or less of a triglyceride and a free fatty acid, or salt thereof, of 1 wt.% or less, wherein the monoglyceride has, as a fatty acid constituent thereof, 30 to 70 wt.% of  $\alpha$  -linolenic acid, 10 to 50 wt.% of oleic acid, 5 to 40 wt.% of the  $\omega$  6-unsaturated fatty acid, 80 to 100 wt.% of an unsaturated fatty acid, and a fatty acid having at least two carbon-to-carbon double bonds/( $\omega$  9-unsaturated fatty acid + saturated fatty acid) at a weight ratio of 1.2 to 5; and the content of fatty acids having at least 4 carbon-to-carbon double bonds is 2 wt.% or less.
4. An oil/fat composition according to claim 1 or 2, which has a POV of 1 or less, has a color (10R + Y) of 25 or less, comprises 75 to 99 wt.% of the monoglyceride, 1 to 5 wt.% of the diglyceride, 24 wt.% or less of a triglyceride and a free fatty acid, or salt thereof, of 0.5 wt.% or less, wherein the monoglyceride has, as a fatty acid constituent thereof, 40 to 65 wt.% of  $\alpha$  -linolenic acid, 12 to 30 wt.% of oleic acid, 10 to 30 wt.% of the  $\omega$  6-unsaturated fatty acid, 90 to 100 wt.% of an unsaturated fatty acid; and the content of a fatty acid having at least two carbon-to-carbon double bonds/( $\omega$  9-unsaturated fatty acid + saturated fatty acid) at a weight ratio of 1.5 to 4; and the content of a fatty acid having at least 4 carbon-to-carbon double bonds is 2 wt.% in all the fatty acid constituents.

<p><b>Related Pending Application</b></p> <p>Related Case Serial No: 10/343742</p> <p>Related Case Filing Date: 02/06/03</p>
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5. An oil/fat composition according to any one of claims 1 to 4, further comprising a phytosterol in an amount of 0.05 wt.% or more.

6. An oil/fat composition according to any one of claims 1 to 4, further comprising 0.02 to 0.5 wt.% of a crystallization inhibitor.

7. An oil/fat composition according to any one of any one of claims 1 to 4, further comprising 0.01 to 5 wt.% of an antioxidant.

8. A food containing an oil/fat composition as claimed in any one of claims 1 to 7.

9. A feed containing an oil/fat composition as claimed in any one of claims 1 to 7.

10. A pharmaceutical composition containing an oil/fat composition as claimed in any one of claims 1 to 7.

11. Method of preparing a food article comprising mixing one or more food materials with the oil/fat composition of as claimed in any one of claims 1 to 7.

12. A method of reducing glutamic oxaloacetic transaminase and glutamic pyruvic transaminase in the blood comprising administering to a patient in need thereof, a food composition comprising the oil/fat composition as claimed in any one of claims 1 to 7.

13. The method as claimed in claim 16, wherein said food composition comprises said oil/fat composition in an amount of 0.1 to 100%.

14. A method of reducing body weight and visceral fat weight in a human or an animal comprising administering to a patient in need thereof, a food composition comprising the oil/fat composition as claimed in any one of claims 1 to 7.

15. The method as claimed in claim 18, wherein said food composition comprises said oil/fat composition in an amount of 1 to 80%.

16. A method of treating obesity comprising administering to a patient in need thereof, a food composition comprising the oil/fat composition as claimed in any one of claims 1 to 7.

17. The method as claimed in claim 20 wherein said food composition comprises said oil/fat composition in an amount of 2 to 80%.

## ABSTRACT

5 An oil/fat composition comprising 5 to 99.9 wt.% of a monoglyceride having, as fatty acid constituents thereof, 15 to 90 wt% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms, 1 to 80 wt.% of an  $\omega$  9-unsaturated fatty acid and 2 to 50 wt.% of an  $\omega$  6-unsaturated fatty acid; and 0.1 to 49.9 wt.% of a diglyceride, wherein a weight ratio of the diglyceride to the monoglyceride is less than 1 and the content of a polyunsaturated fatty acid having at least 4 carbon-to-carbon double bonds is 20% or less in all the fatty acid constituents.

10 The oil/fat composition according to the present invention has excellent processing properties, good taste and excellent lowering action against glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) levels in blood. It is useful not only for pharmaceuticals but also for preventive or remedial foods of feeds effective for hepatic function disturbances or obesity.

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## WHAT IS CLAIMED IS:

1. An edible oil composition comprising:
  - a) at least 15% by weight of diacylglycerol; and
  - b) 2 to 10% by weight of phytosterol having a content of hydrocarbons having 29 to 31 carbon atoms of at most 1 part by weight per 100 parts by weight of the phytosterol, wherein said edible oil composition is a transparent liquid at normal temperature.
2. The edible oil composition according to Claim 1, wherein said diacylglycerol is contained in an amount of from 30 to 95% by weight.
3. The edible oil composition according to Claim 1, wherein said diacylglycerol is contained in an amount of from 55 to 95% by weight.
4. The edible oil composition according to Claim 1, wherein said phytosterol is present in amount of 2% by weight to less than 5% by weight.
5. The edible oil composition according to Claim 1, wherein said content of the hydrocarbons having 29 to 31 carbon atoms is at most 0.9 parts by weight per 100 parts by weight of the phytosterol.
6. A process for producing an edible oil composition, which is liquid at normal temperature, which comprises dissolving a phytosterol composition the content of hydrocarbons having 29 to 31 carbon atoms in which is at most 1 part by weight per 100 parts by weight of phytosterol in an oil comprising at least 15% by weight of diacylglycerol so as to give a phytosterol concentration of 2 to 10% by weight.
7. The production process according to Claim 6, wherein said oil comprises 30 to 95% by weight of diacylglycerol.
8. The production process according to Claim 6, wherein said oil comprises 55 to

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Related Pending Application

Related Case Serial No: 09/907,811

Related Case Filing Date: 07/19/01

95% by weight of diacylglycerol.

9. The production process according to Claim 6, wherein said phytosterol is present in amount of 2% by weight to less than 5% by weight.

10. The production process according to Claim 6, wherein said content of the hydrocarbons having 29 to 31 carbon atoms in said oil is at most 0.9 parts by weight per 100 parts by weight of the phytosterol.

## ABSTRACT OF THE DISCLOSURE

Disclosed herein are an edible oil containing at least 15% by weight of diacylglycerol and 2 to 10% by weight of phytosterol and being a transparent liquid at normal temperature, wherein the content of hydrocarbons having 29 to 31 carbon atoms in the oil and fat is at most 1 part by weight per 100 parts by weight of the phytosterol. The edible oil dissolve phytosterol at a high concentration therein and cause no turbidity at a low temperature.

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS  
PATENT OF THE UNITED STATES IS:

1. An oil-cooked or baked potatoes each of which comprises 3 to 50 wt.% of an oil or fat composition comprising 2 wt.% or less of a monoglyceride and 15 wt.% or greater but less than 50 wt.% of a diglyceride having, as a constituent fatty acid, 15 to 100 wt.% of an  $\omega$ 3 unsaturated fatty acid having less than 20 carbon atoms.
2. The oil-cooked or baked potato of claim 1, wherein said  $\omega$ 3 unsaturated fatty acid having less than 20 carbon atoms is  $\alpha$ -linolenic acid.
3. The oil-cooked or baked potatoes of claim 1, wherein said oil-cooked potatoes are selected from the group consisting of potato chips or fried potatoes and a mixture thereof.
4. The oil-cooked or baked potatoes of claim 1, wherein said oil or fat composition contains 20 to 40% of said diglyceride.
5. The oil-cooked or baked potatoes of claim 1, wherein said  $\omega$ 3 unsaturated fatty acid having less than 20 carbon atoms is present in an amount of 20 to 80% by weight.
6. The oil-cooked or baked potatoes of claim 1, wherein at least 70% of all of said constituent fatty acids of said diglyceride are unsaturated fatty acids having 3 or less carbon-carbon double bonds.
7. The oil-cooked or baked potatoes of claim 1, wherein said oil or fat composition further comprises an antioxidant.
8. A method of preparing an oil-cooked or baked potato comprising heating a potato in contact with an oil or fat composition, wherein said oil or fat composition comprises 2 wt.% or less of a monoglyceride and 15 wt.% or greater but less than 50 wt.% of a diglyceride having, as a constituent fatty acid, 15 to 100 wt.% of an  $\omega$ 3 unsaturated fatty acid having less than 20 carbon atoms.

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Related Pending Application
Related Case Serial No: 091985755
Related Case Filing Date: 11/06/01

## ABSTRACT

5 Provided are oil-cooked or baked potatoes having a small water content, having good texture, having good storage stability, for example, being crispy even after the passage of time and free from deterioration in taste due to a rancid odor of the oil or fat used for them, having good flavor and being excellent in blandness.

Oil-cooked or baked potatoes of the present invention comprise 3 to 50 wt.% of an oil or fat composition containing 2 wt.% or less of a monoglyceride and 15 wt.% or greater but less than 50 wt.% of a diglyceride having, as a constituent fatty acid, 15 to 100 wt.% of an  $\omega$ 3 unsaturated fatty acid having less than 20 carbon atoms.



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WHAT IS CLAIMED IS:

1. An acidic oil-in-water type emulsion composition comprising an oil phase containing at least  
5 20 % by weight of diacylglycerol and 0.5 to 5.0 % by weight of crystallization inhibitor.

2. The acidic oil-in-water type emulsion composition according to Claim 1, wherein the  
10 crystallization inhibitor is selected from polyglycerol fatty acid esters, sucrose fatty acid esters and sorbitan fatty acid esters.

3. The acidic oil-in-water type emulsion composition according to Claim 2, wherein the  
15 polyglycerol fatty acid esters are such that the average polymerization degree of glycerol is 2 to 12, the number of carbon atoms in the fatty acid moiety is 12 to 22, and the degree of esterification is at least 70 %.

20 4. The acidic oil-in-water type emulsion composition according to Claim 2, wherein the sucrose fatty acid esters are such that the degree of esterification with a fatty acid having 12 to 22 carbon atoms is at least 50 %, and the remaining hydroxyl  
25 groups (not esterified with above-mentioned fatty acids) are acetylated.

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Related Pending Application
Related Case Serial No: 10/014,352
Related Case Filing Date: 12/14/01

5. The acidic oil-in-water type emulsion composition according to Claim 2, wherein the sorbitan fatty acid esters are those in which the number of carbon atoms in the fatty acid composition is 12 to 22, and the HLB is lower than 3.

6. The acidic oil-in-water type emulsion composition according to any one of Claims 1 to 5, which further comprises egg yolk.

10

## ABSTRACT OF THE DISCLOSURE

The invention provides an acidic oil-in-water type emulsion composition which has an oil phase containing  
5 at least 20 % by weight of diacylglycerol and 0.5 to 5.0 % by weight of a crystallization inhibitor, and has excellent shelf stability at low temperatures though it contains diacylglycerol at a high concentration, also good in appearance and flavor and useful as a diet or  
10 food for improving lipid metabolism.

# CLAIMS

1. A packaged emulsified beverage, which comprises:  
component (A) comprising a diglyceride having, as a fatty acid constituent thereof 15  
to 90 wt.% of an  $\omega$ 3-unsaturated fatty acid, and

5 component (B): a lipid selected from the group consisting of phospholipids,  
lypoproteins and a mixture thereof.

2. The packaged emulsified beverage of Claim 1, which comprises 0.1 to 8 wt.% of  
said diglyceride.

10 3. The packaged emulsified beverage of claim 1, wherein said  $\omega$ 3-unsaturated fatty  
acid has 12 to 24 carbon atoms.

4. The packaged emulsified beverage of claim 1, wherein said  $\omega$ 3-unsaturated fatty  
acid is selected from the group consisting of  $\alpha$ -linolenic acid, docosahexaenoic acid,  
eicosapentaenoic acid and a mixture thereof.

15 5. The packaged emulsified beverage of Claim 1, wherein said  $\omega$ 3-unsaturated fatty  
acid is  $\alpha$ -linolenic acid.

6. The packaged emulsified beverage of claim 1, wherein Component (A) is  
comprised of at least 50 wt.% of unsaturated fatty acids of all fatty acid constituents.

20 7. The packaged emulsified beverage of claim 1, wherein said diglyceride comprises  
30 wt.% or more of a total oil/fat of said emulsified beverage.

8. The packaged emulsified beverage of claim 1, wherein component (A) comprises  
0.1 to 74.9 wt% of triglycerides, 25 to 95 wt.% of diglycerides and 0.1 to 5 wt.% of  
monoglycerides.

9. The packaged emulsified beverage of claim 1, wherein component (A) comprises

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5 to 59.9 wt.% of triglycerides, 25 to 90 wt.% of diglycerides and 0.1 to 5 wt.% of monoglycerides.

10. The packaged emulsified beverage of claim 1, wherein component (A) comprises 5 to 49.9 wt.% of triglycerides, 50 to 90 wt.% of diglycerides and 0.1 to 5 wt.% of monoglycerides.

11. The packaged emulsified beverage of claim 1, comprising 0.1 to 8 wt.% of component (A).

12. The packaged emulsified beverage of claim 1, comprising 0.1 to 10 wt.% of component (A).

13. The packaged emulsified beverage of claim 1, wherein component (B) is selected from the group consisting of diglyceride-3-phosphoric acid, derivatives of diglyceride-3-phosphoric acid, monoglyceride-3-phosphoric acid, derivatives of monoglyceride-3-phosphoric acid, ceramide-1-phosphoric acid, derivatives of ceramide-1-phosphoric acid, and mixtures comprising at least one of ceramide-1-phosphoric acid, derivatives of ceramide-1-phosphoric acid.

14. The packaged emulsified beverage of claim 1, wherein component (B) is selected from the group consisting of phosphatidylcholine, phosphatidylserine, phosphatidylinositol, phosphatidylethanolamine, phosphatidyl-N-methylethanolamine, and phosphatidyl-N,N-dimethylethanolamine and these components in the lyso form, sphingomyelin, ceramide phosphorylethanolamine, ceramide phosphoryl glycerol, lecithin, lysolecithin and a mixture thereof.

15. The packaged emulsified beverage of claim 1, comprising 0.01 to 0.5 wt.% of component (B).

16. The packaged emulsified beverage of Claim 1, wherein said phospholipid is lecithin or lysolecithin.

17. The packaged emulsified beverage of claim 1, further comprising a package which is hermetically sealed.

18. The packaged emulsified beverage of claim 1, wherein said beverage is a beverage selected from the group consisting of milk tea, milk coffee or a processed milk product.

5

## ABSTRACT OF THE DISCLOSURE

Provided is a packaged emulsified beverage comprising (A) a diglyceride having, as a fatty acid constituent thereof, 15 to 90 wt.% of an  $\omega$ 3-unsaturated fatty acid and (B): a lipid selected from phospholipids and lypoproteins.

- 5        The packaged emulsified beverage according to the present invention maintains good taste even after sterilization and at the same time is excellent in long shelf life.

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS  
PATENT OF THE UNITED STATES IS:

1. A pet food or feed, comprising an oil or fat composition comprising:
  - (A) 10 wt.% or more of diglycerides which comprises as constituent fatty acids, 50  
5 wt.% or more of unsaturated C<sub>14-24</sub> fatty acids and 40 wt. % or less of unsaturated fatty acids  
having at least 20 carbon atoms and at least 4 carbon-carbon double bonds;
  - (B) 20 wt.% or less of free fatty acids, and
  - (E) monoglyceride,wherein a weight ratio of the diglycerides to monoglycerides  $\geq 1$ .
- 10 2. The pet food or feed of Claim 1, wherein constituent fatty acids of said diglyceride  
are comprised of 15 to 90 wt.% of  $\alpha$ -linolenic acid.
3. The pet food or feed of claim 1, comprising 15 to 99 wt.% of diglycerides.
4. The pet food or feed of claim 1, comprising 30 to 99 wt.% of diglycerides.
5. The pet food or feed of claim 1, comprising 70 to 99.% of unsaturated C<sub>14-24</sub> fatty  
15 acids.
6. The pet food or feed of claim 1, wherein a weight ratio of the diglycerides to  
monoglycerides is from 2 to 1,000.
7. The pet food or feed of claim 1, wherein a weight ratio of the diglycerides to  
monoglycerides is from 10 to 500.
- 20 8. The pet food or feed of claim 1, wherein a content of free fatty acids is 10% or  
less.
9. The pet food or feed of claim 1, wherein a content of free fatty acids is 0 to 5%.

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10. The pet food or feed of claim 1, further comprising triglycerides.

11. The pet food or feed of claim 10, wherein said triglyceride is comprised of saturated or unsaturated C<sub>14-24</sub> fatty acids.

12. A pet food or feed, comprising

(C) 0.2 to 60 wt.% of animal proteins comprising myosin or actin; and

(D) 1 to 30 wt.% of an oil or fat composition comprising 10 wt.% or more of diglycerides which comprises as constituent fatty acids, 50 wt.% or more of unsaturated C<sub>14-24</sub> fatty acids and 40 wt.% or less of unsaturated fatty acids having at least 20 carbon atoms and at least 4 carbon-carbon double bonds, 20 wt.% or less of free fatty acids, and monoglyceride,

wherein a weight ratio of the diglycerides to monoglycerides  $\geq 1$ .

13. The pet food or feed of Claim 12, wherein constituent fatty acids of said diglyceride are comprised of 15 to 90 wt.% of  $\alpha$ -linolenic acid.

14. The pet food or feed of claim 12, comprising 15 to 99 wt.% of diglycerides.

15. The pet food or feed of claim 12, comprising 30 to 99 wt.% of diglycerides.

16. The pet food or feed of claim 12, comprising 70 to 99.% of unsaturated C<sub>14-24</sub> fatty acids.

17. The pet food or feed of claim 12, wherein a weight ratio of the diglycerides to monoglycerides is from 2 to 1,000.

18. The pet food or feed of claim 12, wherein a weight ratio of the diglycerides to monoglycerides is from 10 to 500.

19. The pet food or feed of claim 12, wherein a content of free fatty acids is 10%

less.

20. The pet food or feed of claim 12, wherein a content of free fatty acids is 0 to 5%.

21. The pet food or feed of claim 12, further comprising triglycerides.

5 22. The pet food or feed of claim 21, wherein said triglyceride is comprised of saturated or unsaturated C<sub>14-24</sub> fatty acids.

23. The pet food or feed of claim 21, having a weight ratio of animal proteins to diglycerides of 100/0.1 to 1/150.

24. The pet food or feed of claim 21, having a weight ratio of animal proteins to diglycerides of 100/1 to 1/30.

10 25. The pet food or feed of claim 21, further comprising phytosterol.

## ABSTRACT

Provided is a pet food or feed which contains an oil or fat composition having the following components (A) and (B):

5 (A) 10 wt.% or more of diglycerides which contain, as constituent fatty acids, 50 wt.% or more of unsaturated  $C_{14-24}$  fatty acids and 40 wt.% or less of unsaturated fatty acids having at least 20 carbon atoms and at least 4 carbon-carbon double bonds; and

(B) 20 wt.% or less of free fatty acids, wherein a weight ratio of the diglycerides to monoglycerides  $\geq 1$ . The pet food or feed according to the present invention is reduced in an offensive odor derived from animal proteins, particularly, meats and therefore, does not make  
10 pet owners or neighbors feel uncomfortable. It can be prepared without a cumbersome step, only by substituting the part or whole of its oil or fat for a specific oil or fat composition.

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS  
PATENT OF THE UNITED STATES IS:

1. An oil or fat composition comprising 5-100 wt.% of a monoglyceride and/or a diglyceride and which exhibits an index of stability against oxidation (induction time as measured through a Rancimat test conducted at 100°C) of 7 or higher, wherein said monoglyceride and/or the diglyceride contains, as fatty acid constituents,  $\omega$ 3 unsaturated fatty acids in amounts of 15-90 wt.%.
2. The oil or fat composition according to claim 1, wherein said fatty acid constituents are comprised of cis- $\omega$ 3 unsaturated fatty acids, cis- $\omega$ 6 unsaturated fatty acids, saturated fatty acids and trans-unsaturated fatty acids in a weight ratio of cis- $\omega$ 3 unsaturated fatty acids/(cis- $\omega$ 6 unsaturated fatty acids + saturated fatty acids + trans-unsaturated fatty acids) of 1-6, based on the fatty acid constituents of said monoglyceride and/or diglyceride.
3. The oil or fat composition according to claim 1, which further comprising an anti-oxidant.
4. The oil or fat composition according to claim 3, wherein said anti-oxidant is selected from the group consisting of vitamin A, vitamin C, vitamin E, phospholipids, polyphenols and a mixture thereof.
5. The oil or fat composition according to claim 1, which further comprises a phytosterol in an amount of 0.05 wt.% or more.
6. The oil or fat composition according to claim 1, wherein said composition comprises a diglyceride as a mixture containing a 1,3-diglyceride and a 1,2-diglyceride in a proportion by weight of approximately 7 : 3.
7. The oil or fat composition according to claim 1, wherein said composition comprises a monoglyceride as a mixture containing a 1-monoglyceride and a 2-monoglyceride in a proportion by weight of approximately 9 : 1.
8. The oil or fat composition according to claim 1, wherein said percentage of the  $\omega$ 3 unsaturated fatty acids is 20-80%.
9. The oil or fat composition according to claim 1, wherein said percentage of the  $\omega$ 3 unsaturated fatty acids is 30-70%.
10. The oil or fat composition according to claim 1, wherein said composition exhibits percentage of the  $\omega$ 3 unsaturated fatty acids is 40-65%.
11. The oil or fat composition according to claim 1 wherein said fatty acids are

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selected from the group consisting of  $\alpha$ -linolenic acid, stearidonic acid, eicosapentaenoic acid, docosapentaenoic acid, docosahexaenoic acid and a mixture thereof.

12. The oil or fat composition according to claim 1, wherein said monoglyceride and/or said diglyceride comprises as fatty acid constituents, C16-C22 unsaturated fatty acids in amounts of 55-100% .

13. The oil or fat composition according to claim 3, wherein said anti-oxidant is selected from the group consisting of vitamin A, vitamin C, vitamin E, phospholipids, polyphenols, butylhydroxytoluene, butylhydroxyanisole, tert-butylhydroquinone, propyl gallate, rosemary extracts, and a mixture thereof.

14. The oil or fat composition according to claim 1, wherein said composition exhibits an index of stability against oxidation of 9-50.

15. The oil or fat composition according to claim 1, wherein said composition exhibits an index of stability against oxidation of 11-40.

16. The oil or fat composition according to claim 1, wherein said composition exhibits an index of stability against oxidation of 15-30.

17. The oil or fat composition according to claim 1, wherein said composition exhibits an index of stability against oxidation of 20-30.

18. A food comprising the oil or fat composition of any one of claim 1 to 5.

19. An agent for reducing or preventing accumulation of body fat, for reducing or preventing accumulation of visceral fat, or for preventing or treating obesity, which composition comprises the oil or fat composition of any one of claims 1 to 5.

20. A method for reducing or preventing accumulation of body fat, which comprises ingesting the oil or fat composition of any one of claims 1 to 5.

21. A method for reducing or preventing accumulation of visceral fat, which comprises ingesting the oil or fat composition of any of claims 1 to 5.

22. A method for preventing or treating obesity, which comprises ingesting the oil or fat composition of any one of claims 1 to 5.

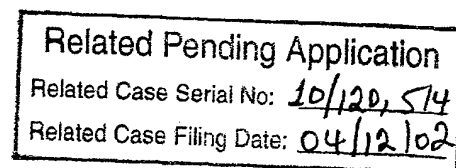
23. A feed or pet food comprising the oil or fat composition of any one of claims 1 to 5.

### ABSTRACT OF THE DISCLOSURE

The oil or fat composition of the invention contains a monoacylglycerol and/or a diacylglycerol in a total amount of 5-100 wt.% and which exhibits an index of stability against oxidation (induction time as measured through a Rancimat test conducted at 100°C) of 7 or higher, wherein the monoacylglycerol and/or the diacylglycerol contain, as fatty acid constituents,  $\omega$ 3 unsaturated fatty acids in amounts of 15-90 wt.%. Through ingestion thereof in a small amount without drastically changing the person's lifestyle, the highly harmless oil/fat composition of the present invention provides effects for reducing and preventing accumulation of body fat, for reducing and preventing accumulation of visceral fat, and for prevention and treatment of obesity; and exerts an excellent prevention and treatment effect on life-style related diseases through long-term ingestion. Thus, the composition of the present invention is useful for foods, pharmaceuticals and pet food or feed.

## CLAIMS:

1. An oil or fat composition comprising:
  - (A) 15 wt.% or more of a diglyceride; and
  - (B) an organic carboxylic acid:  
70 ppm or more on the basis of the diglyceride.
2. The oil or fat composition according to claim 1, comprising 20 to 95% by weight of said diglyceride.
3. The oil or fat composition according to claim 1, comprising said organic carboxylic acid in an amount of 70 to 2,000 ppm.
4. The oil or fat composition according to claim 2, comprising said organic carboxylic acid in an amount of 70 to 2,000 ppm.
5. The oil or fat composition according to claim 1, wherein said organic carboxylic acid is selected from the group consisting of C2-C8 hydroxycarboxylic acids and dicarboxylic acids, salts thereof, and derivatives thereof.
6. The oil or fat composition according to claim 2, wherein said organic carboxylic acid is selected from the group consisting of C2-C8 hydroxycarboxylic acids and dicarboxylic acids, salts thereof, and derivatives thereof.
7. The oil or fat composition according to claim 1 further comprising an anti-oxidation agent.
8. The oil or fat composition according to claim 2, further comprising an anti-oxidation agent.
9. The oil or fat composition according to claim 7, wherein said anti-oxidation agent is selected from the group consisting of rosemary extract, vitamin C or a derivative thereof, or vitamin E.



10. The oil or fat composition according to claim 8, wherein said anti-oxidation agent is selected from the group consisting of rosemary extract, vitamin C or a derivative thereof, or vitamin E.

11. The oil or fat composition according to claim 1, further comprising silicone.

12. The oil or fat composition according to claim 2, further comprising silicone.

13. The oil or fat composition of according to claim 1, wherein said organic acid is selected from the group consisting of citric acid, succinic acid, maleic acid, oxalic acid, aconitic acid, itaconic acid, citraconic acid, tartaric acid, fumaric acid, malic acid, ascorbic acid, galacturonic acid, glucuronic acid, mannuronic acid and a mixture thereof.

14. The oil or fat composition of according to claim 1, wherein said organic acid is selected from the group consisting of citric acid, tartaric acid, malic acid and a mixture thereof .

15. The oil or fat composition of according to claim 2, wherein said organic acid is selected from the group consisting of citric acid, succinic acid, maleic acid, oxalic acid, aconitic acid, itaconic acid, citraconic acid, tartaric acid, fumaric acid, malic acid, ascorbic acid, galacturonic acid, glucuronic acid, mannuronic acid and a mixture thereof.

16. The oil or fat composition of according to claim 2, wherein said organic acid is selected from the group consisting of citric acid, tartaric acid, malic acid and a mixture thereof .

17. The oil or fat composition of according to claim 7, wherein said anti-oxidant is selected from the group consisting of rosemary extract; vitamin C, vitamin E, L-proline, butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), and tert-butylhydroquinone (TBHQ).

18. The oil or fat composition of according to claim 8, wherein said anti-oxidant is selected from the group consisting of rosemary extract; vitamin C, vitamin E, L-proline,



butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), and tert-butylhydroquinone (TBHQ).

19. The oil or fat composition of according to claim 7, wherein said anti-oxidant is selected from the group consisting rosemary extract - vitamin C, vitamin C - vitamin E, and rosemary extract -vitamin E.

20. The oil or fat composition of according to claim 8, wherein said anti-oxidant is selected from the group consisting rosemary extract - vitamin C, vitamin C - vitamin E, and rosemary extract -vitamin E.

21. The oil or fat composition of according to claim 7, wherein said anti-oxidant is rosemary extract present in an amount of 0.02 to 0.5 wt.%.

22. The oil or fat composition of according to claim 8, wherein said anti-oxidant is rosemary extract present in an amount of 0.02 to 0.5 wt.%.

23. The oil or fat composition of according to claim 7, wherein said anti-oxidant is vitamin C or a derivative thereof present in an amount of 0.0004 wt.% or more, as reduced to the amount of ascorbic acid.

24. The oil or fat composition of according to claim 8, wherein said anti-oxidant is vitamin C or a derivative thereof present in an amount of 0.0004 wt.% or more, as reduced to the amount of ascorbic acid.

25. The oil or fat composition of according to claim 7, wherein said anti-oxidant is vitamin E present in an amount of 0.01 wt.% or more, in terms of tocopherol.

26. The oil or fat composition of according to claim 8, wherein said anti-oxidant is vitamin E present in an amount of 0.01 wt.% or more, in terms of tocopherol.

27. A method of producing fried foods comprising subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 1.

28. A method of producing fried foods comprising subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 2.

29. A method of producing fried foods comprising subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 9.

30. A fried food produced through subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 1.

31. A fried food produced through subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 2.

32. A fried food produced through subjecting food ingredients to a cooking process by use of an oil or fat composition as described in claim 9.

## ABSTRACT OF THE DISCLOSURE

An oil or fat composition containing 15 wt% or more of diglyceride (component (A)) and 70 ppm or more, on the basis of the diglyceride, of an organic carboxylic acid (Component (B)).

## CLAIMS:

1. A process for hydrolyzing an oil or fat by mixing and feeding an oil-phase substrate and a water-phase substrate to a packed layer with an immobilized enzyme packed therein, wherein  
5 said oil or fat is subjected to a hydrolytic reaction under feeding conditions such that a shear stress factor ( $\tau_w$ ), which is applied to a surface of said immobilized enzyme and is expressed by the following formula (1):

$$\tau_w = (\Delta P/L) \times d_p \times \varepsilon / (1 - \varepsilon) \quad (1)$$

10 wherein  $\Delta P$  represents a maximum pressure loss [MPa] through said packed layer during said hydrolytic reaction,  $L$  represents a thickness [m] of said packed layer,  $d_p$  represents a weight-basis average particle size [m] of particles of said packed, immobilized enzyme, and  $\varepsilon$  represents a void volume [-] of said  
15 packed layer, remains within a range of from  $1 \times 10^{-4}$  to  $1.4 \times 10^{-3}$  MPa.

2. A process according to claim 1, wherein said oil-phase substrate and said water-phase substrate are fed to said packed layer as a water-in-oil emulsion having an average droplet size  
20 of from 40 to 200  $\mu\text{m}$ .

3. A process according to claim 1, wherein said shear stress factor ( $\tau_w$ ) is  $1 \times 10^{-4}$  to  $1 \times 10^{-3}$  MPa

4. A process according to claim 1, wherein said oil or fat is a triglyceride.

25 5. A process according to claim 1, wherein said

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immobilized enzyme is lipase.

6. A process according to claim 1, wherein said immobilized enzyme is lipase immobilized on an anion exchange resin.

## ABSTRACT OF THE DISCLOSURE

A process is disclosed for hydrolyzing an oil or fat by mixing and feeding an oil-phase substrate and a water-phase substrate to a packed layer with an immobilized enzyme packed therein. The oil or fat is subjected to a hydrolytic reaction under feeding conditions such that a shear stress factor ( $\tau_w$ ), which is applied to a surface of said immobilized enzyme and is expressed by the following formula (1):

$$\tau_w = (\Delta P/L) \times d_p \times \varepsilon / (1-\varepsilon) \quad (1)$$

wherein  $\Delta P$  represents a maximum pressure loss [MPa] through said packed layer during said hydrolytic reaction,  $L$  represents a thickness [m] of said packed layer,  $d_p$  represents a weight-basis average particle size [m] of particles of said packed, immobilized enzyme, and  $\varepsilon$  represents a void volume [-] of said packed layer, remains within a range of from  $1 \times 10^{-4}$  to  $1.4 \times 10^{-3}$  MPa. The reaction of the oil-phase substrate and the water-phase substrate in the packed layer of the immobilized enzyme of high activity under the predetermined conditions allows the immobilized enzyme to more effectively exhibit its activity, so that the efficiency of the hydrolytic reaction is heightened to increase the productivity and the serviceability of the immobilized enzyme is also improved.

FIG. 1

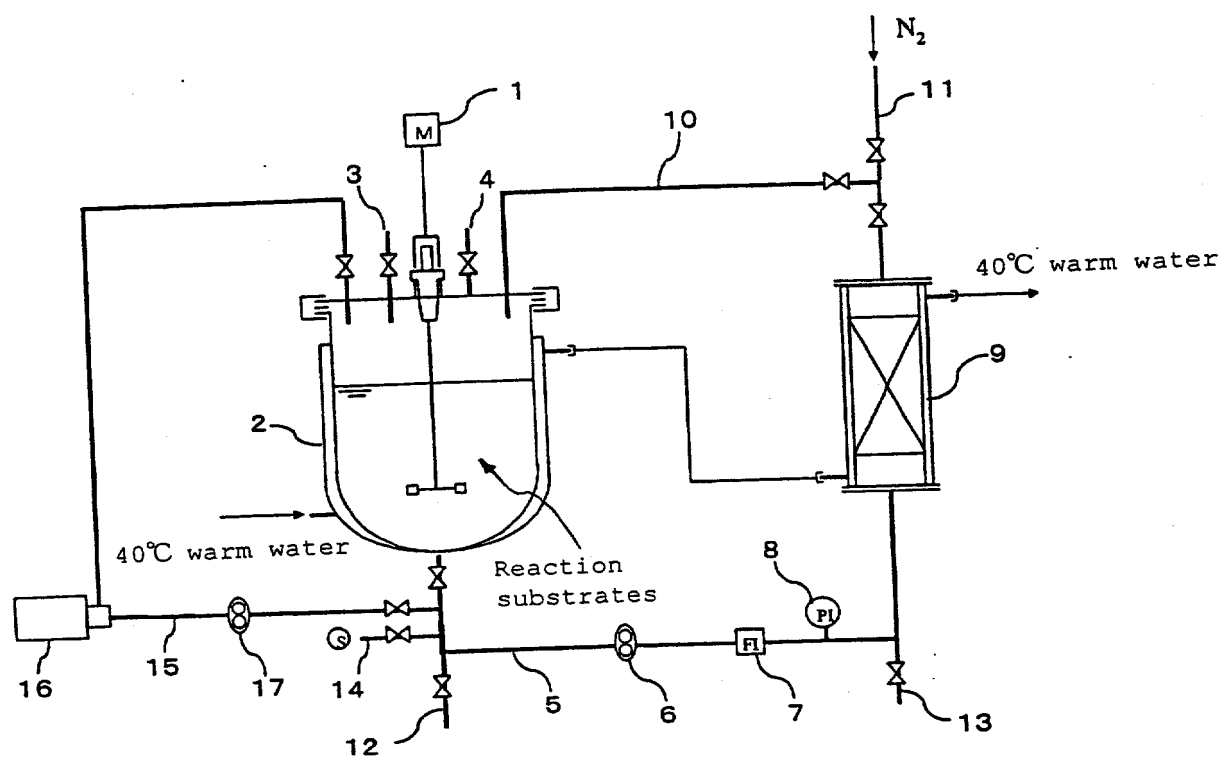


Fig. 2

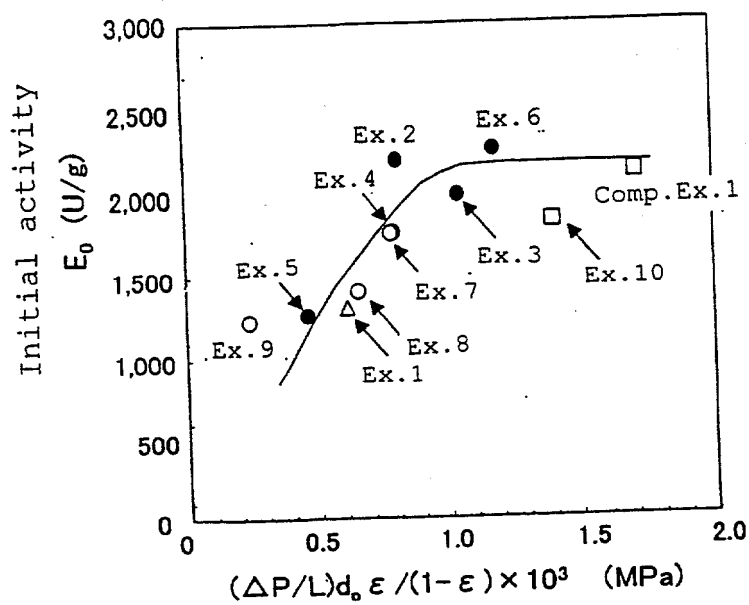
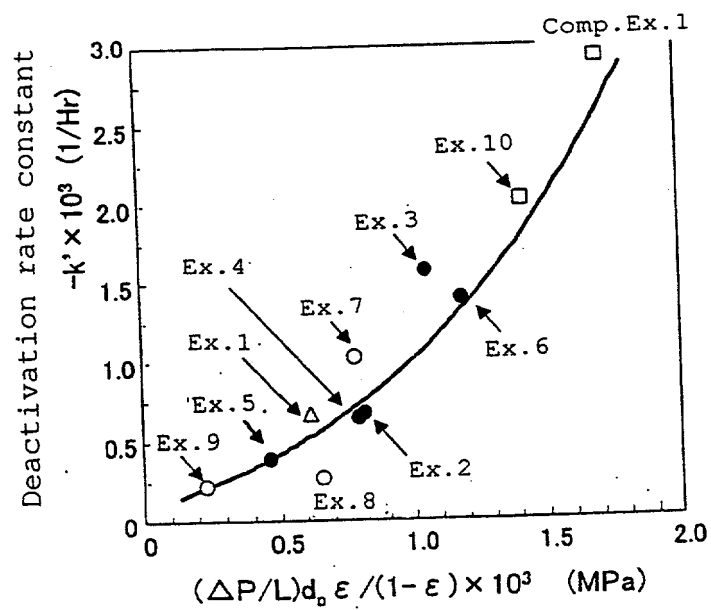


Fig. 3





## Claims

1. An oil/fat composition comprising 60 to 100 wt.% of a diglyceride, wherein said diglyceride has, as fatty acid constituents thereof, 15 to 90 wt.% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms and a cis  $\omega$  3-unsaturated fatty acid/(cis  $\omega$  6-unsaturated fatty acid + saturated fatty acid + trans unsaturated fatty acid) at a weight ratio of 1 to 6.

2. The oil/fat composition according to claim 1, wherein said  $\omega$  3-unsaturated fatty acid is  $\alpha$  -linolenic acid.

3. The oil/fat composition according to claim 1 or 2, wherein said diglyceride has, as the fatty acid constituents thereof, 10 to 60 wt.% of an  $\omega$  9-unsaturated fatty acid.

4. The oil/fat composition according to any one of claims 1 to 3, which comprises 65 to 99 wt.% of said diglyceride, 0.1 to 4 wt.% of a monoglyceride, 0.1 to 34.9 wt.% of a triglyceride and 1.5 % or less of a free fatty acid (salt), wherein said diglyceride has, as fatty acid constituents thereof, 20 to 80 wt.% of  $\alpha$  -linolenic acid, 10 to 60 wt.% of oleic acid, 2 to 50 wt.% of an  $\omega$  6-unsaturated fatty acid, 70 to 100 wt.% of an unsaturated fatty acid and a cis  $\omega$  3-unsaturated fatty acid/(cis  $\omega$  6-unsaturated fatty acid + saturated fatty acid + trans unsaturated fatty acid) at a weight ratio of 1.2 to 5; the triglyceride has, as a fatty acid constituent thereof, 70 to 100% of an unsaturated fatty acid; and the content of a polyunsaturated fatty acid having at least 4 carbon-carbon double bonds is 5 wt.% or less based on all the fatty acid constituents of the oil/fat composition.

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5. The oil/fat composition according to any one of claims 1 to 3, which comprises 70 to 95 wt.% of said diglyceride, 0.1 to 2 wt.% of a monoglyceride, 2 to 29.9 wt.% of a triglyceride and 1 wt.% or less of a free fatty acid (salt), wherein said diglyceride has, as fatty acid constituents thereof, 30 to 70 wt.% of  $\alpha$ -linolenic acid, 10 to 50 wt.% of oleic acid, 5 to 40 wt.% of an  $\omega$  6-unsaturated fatty acid, 80 to 100 wt.% of an unsaturated fatty acid and a cis  $\omega$  3-unsaturated fatty acid/(cis  $\omega$  6-unsaturated fatty acid + saturated fatty acid + trans unsaturated fatty acid) at a weight ratio of 1.4 to 4; the triglyceride has, as a fatty acid constituent thereof, 80 to 100 wt.% of an unsaturated fatty acid; and the content of a polyunsaturated fatty acid having at least 4 carbon-carbon double bonds is 2% or less based on all the fatty acid constituents of the oil/fat composition.

6. The oil/fat composition according to any one of claims 1 to 3, which comprises 75 to 92 wt.% of said diglyceride, 0.1 to 1.5 wt.% of a monoglyceride, 6 to 24.9 wt.% of a triglyceride and 0.5 wt.% or less of a free fatty acid (salt), wherein said diglyceride has, as fatty acid constituents thereof, 40 to 65 wt.% of  $\alpha$ -linolenic acid, 12 to 30 wt.% of oleic acid, 10 to 30 wt.% of an  $\omega$  6-unsaturated fatty acid, 90 to 100 wt.% of an unsaturated fatty acid and a cis  $\omega$  3-unsaturated fatty acid/(cis  $\omega$  6-unsaturated fatty acid + saturated fatty acid + trans unsaturated fatty acid) at a weight ratio of 1.5 to 3; the triglyceride has, as a fatty acid constituent thereof, 90 to 100% of an unsaturated fatty acid; and the content of a polyunsaturated fatty acid having at least 4 carbon-carbon double bonds is 0 based on all the fatty acid constituents of the oil/fat composition.

7. The oil/fat composition according to any one of claims 1 to 6, which further comprises a phytosterol in an amount of 0.05 wt.% or greater.

8. A food comprising the oil/fat composition as claimed in any one of Claims 1 to 7.

5 9. A feed comprising the oil/fat composition as claimed in any one of claims 1 to 7.

10. A pharmaceutical comprising the oil/fat composition of as claimed in any one of claims 1 to 7..

10 11. The food according to claim 8, which is an oil-in-water type oil/fat-containing food.

12. The food according to claim 8, which is a water-in-oil type oil/fat-containing food.

13. The food according to claim 8, which is a pocket-size oil/fat-containing food.

15 14. The food according to claim 8, which is a bakery food.

15. In a method of preparing a food composition comprising a far or oil, the improvement comprising preparing said food composition with the oil/fat composition of claim 1.

## Abstract

Provided is an oil/fat composition comprising 60 to 100 wt.% of a diglyceride wherein the diglyceride has, as the fatty acid constituent thereof, 15 to 90 wt.% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms and a cis  $\omega$  3-unsaturated fatty acid/(cis  $\omega$  6-unsaturated fatty acid + saturated fatty acid + trans unsaturated fatty acid) at a weight ratio of 1 to 6.

The composition is excellent in visceral fat burning property, body fat burning property and stability against autoxidation.

**Claims**

1. An oil/fat composition comprising:

i) 10.1 to 94.9 wt.% of a triglyceride;

ii) 0.1 to 30 wt.% of a monoglyceride; and

5       iii) 5 to 59.9 wt.% of a diglyceride which has, as a fatty acid constituent thereof, 15 to 90 wt.% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms.

2. The oil/fat composition according to claim 1, wherein said  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms is  $\alpha$  -linolenic acid.

10       3. The oil/fat composition according to claim 1 or 2, wherein a weight ratio of said diglyceride to said monoglyceride is greater than or equal to 1 and POV is 10 or less.

4. The oil/fat composition according to any one of claims 1 to 3, which has a POV of 3 or less, has a color (10R + Y) of 25 or less, and comprises 47 to 89.9 wt.% of said triglyceride, 0.1 to 2 wt.% of said monoglyceride, 10 to 50 wt.% of said  
15       diglyceride, and 1 wt.% or less of a free fatty acid (salt), wherein said diglyceride has, as fatty acid constituents thereof, 30 to 70 wt.% of  $\alpha$  -linolenic acid, 10 to 50 wt.% of oleic acid, 5 to 40 wt.% of an  $\omega$  6-unsaturated fatty acid, a fatty acid having at least two carbon-carbon double bonds/(  $\omega$  9-unsaturated fatty acid + saturated fatty acid) at a  
20       weight ratio of 1.2 to 5, 80 to 100 wt.% of an unsaturated fatty acid; said triglyceride has, as said fatty acid constituents thereof, 25 wt.% or less of an  $\omega$  3-unsaturated fatty acid and 55 to 100 wt.% of an unsaturated fatty acid; and the content of a fatty acid

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having at least 4 carbon-carbon double bonds is 2 wt.% or less in all the fatty acid constituents.

5        5. The oil/fat composition according to any one of claims 1 to 3, which has a POV of 1 or less, has a color (10R + Y) of 20 or less, and comprises 53 to 84.9 wt.% of said triglyceride, 0.1 to 1.5 wt.% of said monoglyceride, 15 to 45% of said diglyceride, and 0.5 wt.% or less of a free fatty acid (salt), wherein said diglyceride has, as fatty acid constituents thereof, 40 to 65 wt.% of  $\alpha$ -linolenic acid, 12 to 30 wt.% of oleic acid, 10 to 30 wt.% of an  $\omega$  6-unsaturated fatty acid, a fatty acid having at least two carbon-carbon double bonds/( $\omega$  9-unsaturated fatty acid + saturated fatty acid) at a weight ratio  
0        of 1.5 to 4 and 90 to 100 wt.% of an unsaturated fatty acid; said triglyceride has, as fatty acid constituents thereof, 20 wt.% or less of an  $\omega$  3-unsaturated fatty acid and 70 to 100 wt.% of an unsaturated fatty acid; and all said fatty acid constituents are free of a fatty acid having at least 4 carbon-carbon double bonds.

5        6. The oil/fat composition according to any one of claims 1 to 5, which further comprises a phytosterol in an amount of 0.05 wt.% or greater.

7. A food comprising the oil/fat composition as claimed in any one of claims 1 to 6.

8. A feed comprising the oil/fat composition as claimed in any one of claims 1 to 6.

20        9. A pharmaceutical comprising the oil/fat composition as claimed in any one of claims 1 to 6.

10. A cooking oil comprising the oil/fat composition as claimed any one of claims 1 to 6.

11. The food according to claim 7, wherein said food is an oil-in-water type oil/fat-containing food.

12. The food according to claim 7, wherein said food is a water-in-oil type oil/fat-containing food.

5 13. The food according to claim 7, wherein said food is a pocket-size oil/fat-containing food.

14. A food according to claim 7, wherein said food is a bakery food.

15. In a method of preparing a food composition comprising a fat or oil, the improvement comprising preparing said food composition with the oil/fat composition  
10 as claimed in any one of claims 1 to 6.

16. In a method of cooking a food composition in an oil/fat, the improvement comprising heating a food in the oil/fat composition as claimed in any one of claims 1 to  
6.

## Abstract

Provided is an oil/fat composition comprising 10.1 to 94.9 wt.% of a triglyceride, 0.1 to 30 wt.% of a monoglyceride and 5 to 59.9 wt.% of a diglyceride which has, as a fatty acid constituent thereof, 15 to 90 wt.% of an  $\omega$  3-unsaturated fatty acid having less than 20 carbon atoms.

The oil/fat composition of the present invention has excellent heat stability, has body-fat-accumulation resisting action, visceral-fat-accumulation resisting action, blood-sugar-level lowering action, insulin resistance improving action and leptin lowering action and is useful for, as well as pharmaceuticals, preventive or remedial food for diabetes or obesity, and feed.



WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS  
PATENT OF THE UNITED STATES IS:

1. A fat composition comprising:
  - (A) a fat containing at least 15% by weight of diglycerides;
  - (B) a fatty acid L-ascorbic ester; and
  - (C) a component selected from among catechin, rosemary extract, sage extract and turmeric extract.
2. The fat composition of claim 1, wherein the catechin is that having an ash content of at most 5% by weight.
3. The fat composition of claim 1, which further comprises silicone.
4. The fat composition of claim 1, wherein said fat is selected from the group consisting of vegetable oil, animal oil, hardened oils, fractionated oils, random transesterified oils thereof and mixtures thereof.
5. The fat composition of claim 1, wherein said fat is selected from the group consisting of soybean oil, rapeseed oil, palm oil, rice oil, corn oil, beef tallow, fish oil, hardened oils, fractionated oils, random transesterified oils thereof and mixtures thereof.
6. The fat composition of claim 1, wherein said fatty acid L-ascorbic ester is selected from the group consisting of L-ascorbyl palmitate, L-ascorbyl stearate and a mixture thereof.
7. The fat composition of claim 1, wherein said fatty acid L-ascorbic ester is present in an amount of at least 0.006 wt. %.
8. The fat composition of claim 1, wherein said fatty acid L-ascorbic ester is present in an amount of 0.01 to 0.05 wt. %.
9. The fat composition of claim 1, wherein said fatty acid L-ascorbic ester is present

in an amount of 0.02 to 0.04 wt.%.

10. The fat composition of claim 1, wherein component (C) is a catechin selected from the group consisting of epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate and a mixture thereof.

11. The fat composition of claim 10, wherein said catechin is present in an amount of at least 0.004 wt %.

12. The fat composition of claim 10, wherein said catechin is present in an amount of 0.008 to 0.08 wt.%.

13. The fat composition of claim 1, wherein component (C) is a rosemary extract or a sage extract present in an amount of 200 to 5,000 ppm.

14. The fat composition of claim 1, wherein component (C) is a rosemary extract or a sage extract present in an amount of 500 to 3,500 ppm.

15. The fat composition of claim 1, wherein component (C) is a turmeric extract present in an amount of 50 to 1,000 ppm.

16. The fat composition of claim 15, wherein said turmeric extract is present in an amount of 100 to 1,000 ppm.

17. The fat composition of claim 1, wherein said catechin and said fatty acid L-ascorbate ester are used, in a weight ratio of 0.03 to 3.

18. The fat composition of claim 1, wherein said rosemary extract or sage extract and said fatty acid L-ascorbate ester are used in a weight ratio of 1 to 20.

19. The fat composition of claim 1, wherein said turmeric extract and said fatty acid L-ascorbate ester are used in a weight ratio of 0.1 to 5.

20. A method of producing a confectionary selected from the group consisting of

fried rice, fried wheat, fried corn, fried potato, fried sweet potato type, fried potato, fried chicken, fries, doughnut, instant noodles comprising heating a confectionary selected from the group consisting of rice, wheat, corn, potato, sweet potato, chicken, dough, in the fat composition of claim 1.

### ABSTRACT OF THE DISCLOSURE

The invention provides a fat composition comprising:

(A) a fat containing at least 15% by weight of diglycerides;

(B) a fatty acid L-ascorbic ester; and

(C) a component selected from among catechin, rosemary extract, sage extract and turmeric extract.

The fat composition is excellent in oxidation stability, flavor and appearance.

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## CLAIMS

1. A method for producing fried instant noodles, comprising heating noodles in an oil/fat composition comprising at least 50 wt.% of diglycerides.
2. The method of claim 1, wherein said oil/fat composition comprises at least 60  
5 wt.% of diglycerides.
3. The method of claim 1, wherein said oil/fat composition comprises at least 65 wt.% of diglycerides.
4. The method of claim 1, wherein said oil/fat composition comprises at least 70 wt.% of diglycerides.
- 10 5. The method of claim 1, wherein said diglyceride contains acyl groups having 8 to 24 carbon atoms.
6. The method of claim 1, wherein said diglyceride contains acyl groups having 16 to 22 carbon atoms.
7. The method of claim 1, wherein said diglyceride contains at least 70 %  
15 unsaturated acyl groups of the whole constituent acyl groups.
8. The method of claim 1, wherein said noodle comprises 0.001 to 1 % by weight of an antioxidant.
9. The method of claim 8, wherein said antioxidant is selected from the group consisting of vitamin E, ascorbic acid, a higher fatty acid ester of ascorbic acid, catechin,  
20 rosemary and a mixture thereof.
10. The method of claim 8, wherein said antioxidant is ascorbic palmitate.

11. The method of claim 1, wherein said oil/fat composition is at a temperature of from 120 to 160 °C.

12. The method of claim 1, wherein said oil/fat composition is at a temperature of from 130 to 150 °C.

5           13. The method of claim 1, wherein heating is conducted for a time of from 0.3 to 5 minutes.

14. The method of claim 1, wherein heating is conducted for a time of from 0.5 to 3 minutes.

10           15. The method of claim 1, wherein said noodles are comprised of flour, a noodle quality improver, a thickening polysaccharide and egg powder.

16. The method of claim 1, wherein said noodles are prepared by the steps comprising:

- 15           i) preparing a dough from raw materials,  
             ii) laminating said dough;  
             iii) rolling said dough;  
             iv) sheeting said dough;  
             v) slitting said dough to form noodle strands;  
             vi) steam heating said noodle strands of step v); and  
             vii) molding steam heated noodles of step vi).

20           17. The method of claim 15, wherein said flour is selected from the group consisting of wheat flour, buckwheat flour and a mixture thereof.

18. The method of claim 1, wherein said fried instant noodles are selected from the group consisting of *udon* noodles, *soba* noodles, *ramen* noodles and pasta.

19. A method of preparing instant noodles comprising:

- i) heating noodles in an oil/fat composition comprising at least 50 wt.% of diglycerides to form fried instant noodles; and
- ii) reconstituting said fried instant noodles with water.

5

20. Fried instant noodles obtained by the process of claim 1.

## ABSTRACT

This invention relates to a process for producing fried instant noodles, which is characterized in that an oil/fat composition comprising at least 50 wt.% of diglycerides is used as frying oil; and also to fried instant noodles obtained by the process.

- 5      This process provides a process for producing fried instant noodles which, when reconstituted with hot or boiling water, have smooth surfaces to give good mouthfeel, are not prone to sogginess, do not smell oily, and have an excellent flavor inherent to flour; and also fried instant noodles obtained by the production process.



Fig. 1

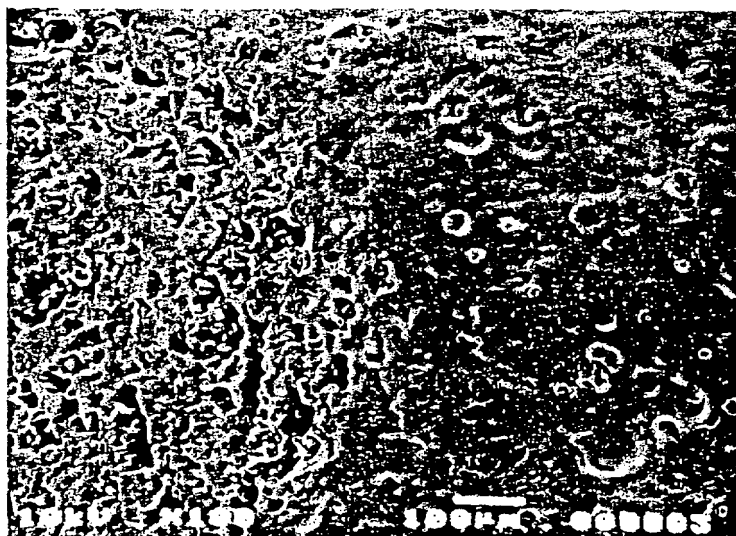


Fig. 2

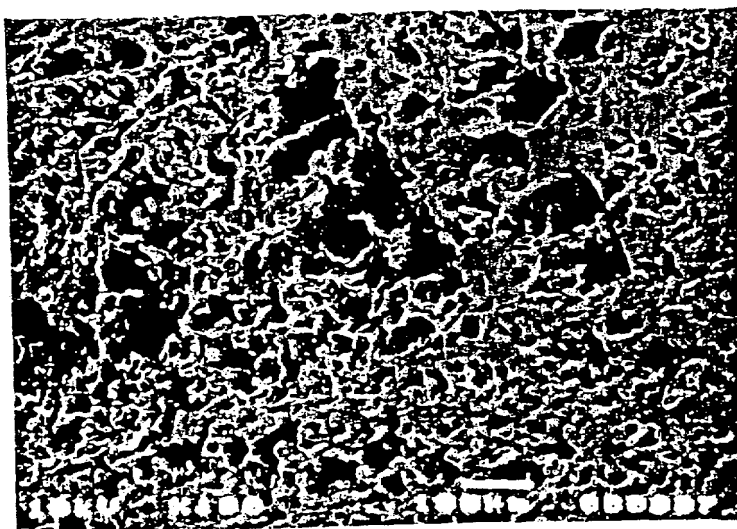


Fig. 3

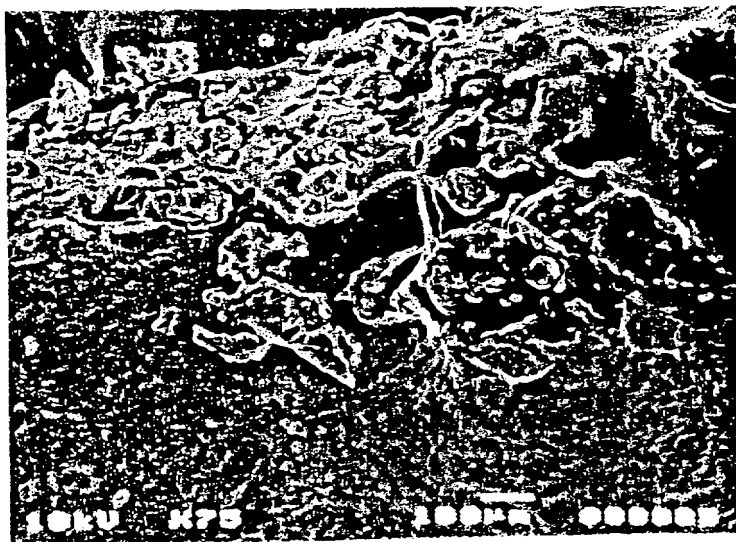
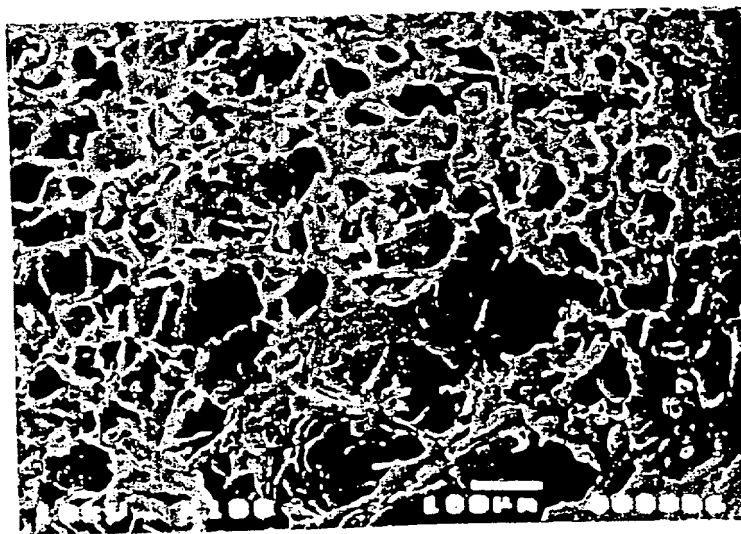


Fig. 4



## WHAT IS CLAIMED IS:

1. A method for activating lipid catabolism in the small intestine epithelium, which comprises administering an effective amount of a diglyceride.

5           2. The method according to claim 1, wherein 15 to 90 wt.% of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

          3. The method according to claim 1 or 2, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.%  
10 of the whole diglyceride.

          4. A method for promoting accumulation of fatty acids into the small intestine epithelium, which comprises administering an effective amount of a diglyceride.

          5. The method according to claim 4, wherein 15 to 90 wt.%  
15 of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

          6. The method according to claim 4 or 5, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

20           7. A method for inducing expression of a small intestine lipid metabolic gene, which comprises administering an effective amount of a diglyceride.

          8. The method according to claim 7, wherein 15 to 90 wt.%  
25 of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

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Related Pending Application  
Related Case Serial No: 10/1131188  
Related Case Filing Date: 04/25/02

9. The method according to claim 7 or 8, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

10. A method for suppressing synthesis of a triglyceride in the small intestine epithelium, which comprises administering an effective amount of a diglyceride.

11. The method according to claim 10, wherein 15 to 90 wt.% of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

12. The method according to claim 10 or 11, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

13. A method for promoting energy consumption, which comprises administering an effective amount of a diglyceride.

14. The method according to claim 10, wherein 15 to 90 wt.% of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

15. The method according to claim 13 or 14, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

16. A method for lowering a serum RLP level, which comprises administering an effective amount of a diglyceride.

17. The method according to claim 16, wherein 15 to 90 wt.% of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

18. The method according to claim 16 or 17, wherein 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

19. A method for lowering a serum leptin level, which  
5 comprises administering an effective amount of a diglyceride.

20. The method according to claim 19, wherein 15 to 90 wt.% of constituent fatty acids of said diglyceride comprise  $\omega$ 3 unsaturated fatty acids.

21. The method according to claim 19 or 20, wherein  
10 1,3-diglycerides in said diglyceride amount to at least 50 wt.% of the whole diglyceride.

## ABSTRACT OF THE DISCLOSURE

Disclosed are a method for activating lipid metabolism in the small intestine epithelium and also a method for promoting accumulation of fatty acids into the small intestine epithelium, each of which features administering an effective amount of a diglyceride. Ingestion of the diglyceride leads to accumulation of the fatty acids in the small intestine. The fatty acids so accumulated promote induction of  $\beta$ -oxidation, thereby not only activating lipid catabolism but also making it difficult to allow lipids to accumulate as triglycerides. This series of actions eventually results in development of lowering action for blood remnant-like lipoprotein level and also lowering action for blood leptin level, and hence, lipid metabolism is improved. Further, energy consumption is enhanced by promoting the induction of  $\beta$ -oxidation and activating lipid catabolism.

FIG 1

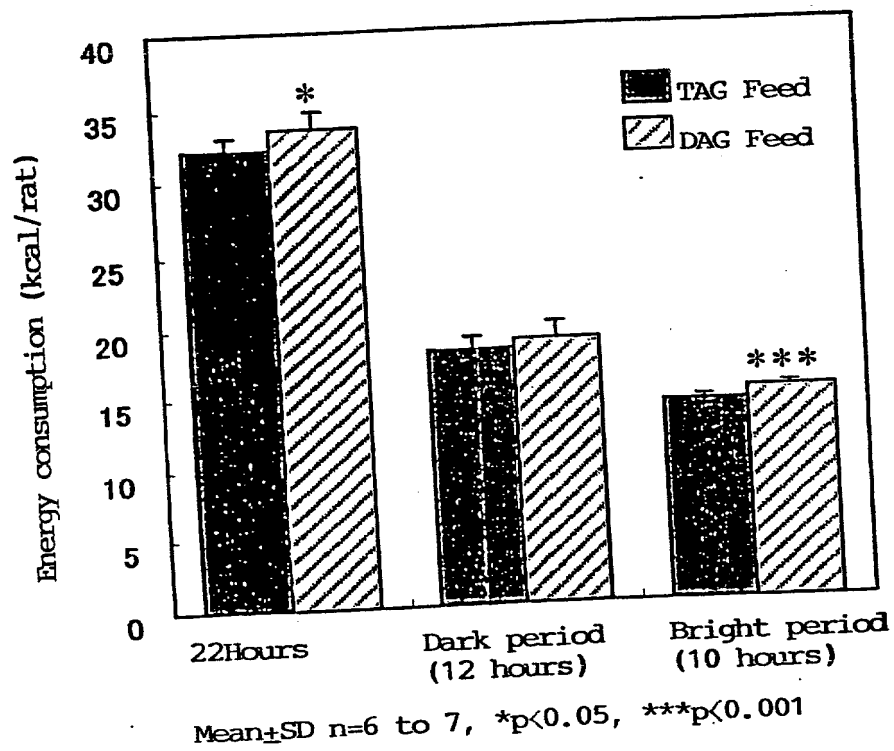
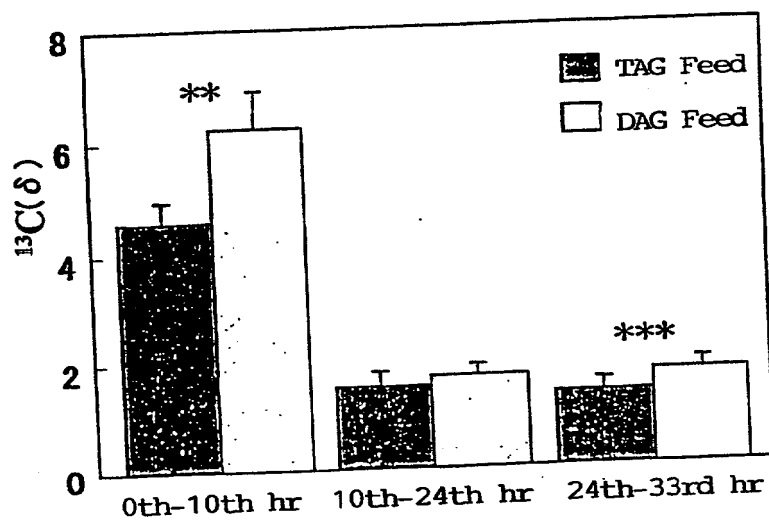


FIG 2

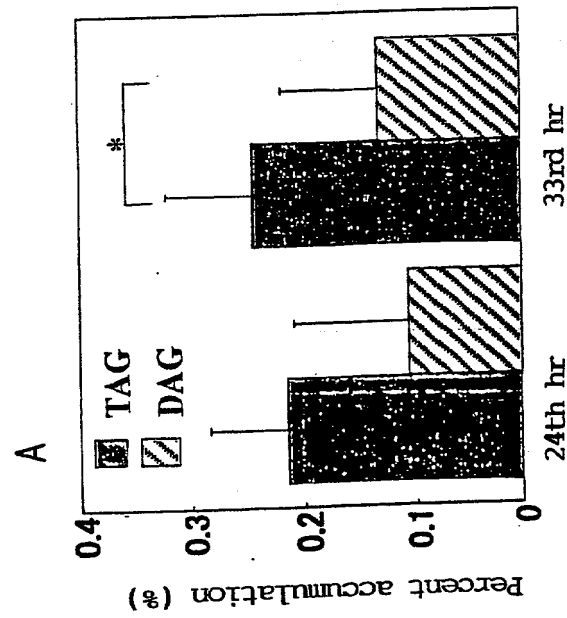


Mean $\pm$ SD, n=8 pergroup

Significance between 2 groups \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$

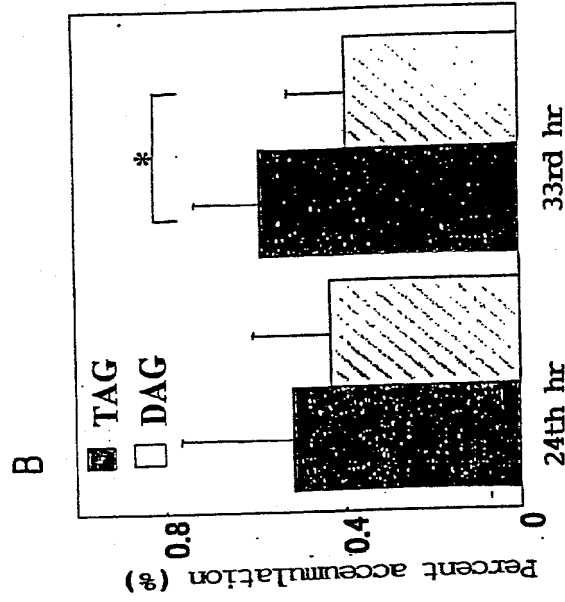


FIG. 3A



\*p < 0.05 (significance between 2 groups)  
(n=6 per group)

FIG. 3B



\*p < 0.05 (significance between 2 groups)  
(n=6 per group)

## WHAT IS CLAIMED IS:

1. A method for producing fried foods, which comprises cooking with an oil composition containing at least 15% by weight of diglycerides as a frying oil, wherein the content of nitrogen in at least 5 liters of the oil composition is kept to 0.2% by weight or lower.

2. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is such that the frying is conducted under frying conditions that the time required to replace the whole oil, which is defined by the following equation (1), amounts to 2 to 25 hours:

Time required to replace the whole oil (unit: hour) =

$$\frac{\text{(Total amount of oil in a fryer)}}{\text{(Average amount of new oil supplied per hour)}} \quad (1)$$

3. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is such that the frying oil is treated with a nitrogen adsorbent.

4. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is such that materials of fry, whose nitrogen content is 2% by weight or

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lower, are used.

5. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is such that migration of nitrogen from materials of fry, whose nitrogen content exceeds 2% by weight, into the frying oil is prevented.

10 6. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is such that 2 or more of the methods according to Claims 2 to 5 are combined with each other.

15

7. The method according to Claim 1, wherein the method for keeping the nitrogen content in the oil composition to 0.2% by weight or lower is a combination of the methods according to Claims 2, 3 and 4 or a combination of the methods according to Claims 2, 3 and 5, and the nitrogen content in the oil composition is kept to 0.05% by weight or lower.

8. The method according to any one of Claims 1 to 7, wherein the oil composition containing at least 15% by weight of diglycerides as the frying oil comprises 50 to 5,000 ppm of an antioxidant.

9. The method according to any one of Claims 1 to 8, wherein the oil composition containing at least 15% by weight of diglycerides as the frying oil comprises 50 to 2,000 ppm of an organic carboxylic acid.

5

10. Fried foods produced by the method according to any one of claims 1 to 9.

## ABSTRACT OF THE DISCLOSURE

Disclosed herein is a method for producing fry, which comprises cooking with an oil composition containing at  
5 least 15% by weight of diglycerides as a frying oil, wherein the content of nitrogen in at least 5 liters of the oil composition is kept to 0.2% by weight or lower.

The method permits repeatedly producing fry good in appearance and flavor without causing coloring of an oil  
10 and emission of offensive odor in fry workshops, daily dish shops, eating houses, restaurants, etc. where fry is mass-produced over a long period of time using a diglyceride-containing oil composition having an effect to reduce the accumulation of body fat to prevent obesity.

What is claimed is:

1. A fat or oil composition which comprises at least 35 wt% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol, and further comprising phytosterol in an amount of not less than 0.05 wt%, wherein administration of an effective amount of the composition to a subject lowers the PAI-1 activity level in said subject.

2. A fat or oil composition according to claim 1, wherein the constituent fatty acids of said diacylglycerol satisfy the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  9.

3. A fat or oil composition according to claim 1, wherein the amount of the saturated fatty acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol.

4. A fat or oil processed food comprising a fat or oil composition as claimed in claim 1.

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Related Pending Application
Related Case Serial No: 10/244,336
Related Case Filing Date: 09/17/02

5. An HDL-cholesterol-level elevating agent  
comprising a fat or oil composition as claimed in claim  
1.

6. A method for lowering the activity of PAI-1,  
5 which comprises administering a fat or oil composition as  
claimed in claim 1.

7. A method for elevating the HDL cholesterol level  
in the blood of a patient in need thereof, comprising  
administering to said patient in need thereof, a fat or  
10 oil composition as claimed in Claim 1.

8. A method for lowering the activity of PAI-1 in a  
patient in need thereof, comprising administering to said  
patient in need thereof, a fat or oil composition as  
claimed in claim 1.

15 9. A fat or oil composition which comprises at  
least 80 wt% of a diacylglycerol, the constituent fatty  
acids of said diacylglycerol satisfying the following  
equation:  $(\text{an amount of a cis-form unsaturated fatty acid}) / (\text{an amount of a saturated fatty acid} + \text{an amount of a trans-form unsaturated fatty acid}) \geq 6$ , wherein the  
20 amount of the trans-form unsaturated acid is not greater  
than 5 wt% based on the constituent fatty acids of said  
diacylglycerol, wherein administration of an effective  
amount of the composition to a subject lowers the PAI-1  
25 activity level in said subject.

10. A fat or oil composition according to claim 9, which further comprises phytosterol in an amount not less than 0.05 wt%.

11. A fat or oil composition according to claim 9,  
5 wherein the constituent fatty acids of said diacylglycerol satisfy the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  9.

10 12. A fat or oil composition according to claim 9, wherein the amount of the saturated fatty acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol.

13. A fat or oil processed food comprising a fat or  
15 oil composition as claimed in claim 9.

14. An HDL-cholesterol-level elevating agent comprising a fat or oil composition as claimed in claim 9.

15. A method for elevating the HDL cholesterol  
20 level in the blood of a patient in need thereof, comprising administering to said patient in need thereof, a fat or oil composition as claimed in claim 9.

16. A method for lowering the activity of PAI-1 in a patient in need thereof, comprising administering to  
25 said patient in need thereof, a fat or oil composition as claimed in claim 9.



17. A fat or oil composition which comprises at least 80 wt% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol.

18. A fat or oil composition according to claim 17, which further comprises phytosterol in an amount not less than 0.05 wt%.

19. A fat or oil composition according to claim 17, wherein the constituent fatty acids of said diacylglycerol satisfy the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  9.

20. A fat or oil composition according to claim 17, wherein the amount of the saturated fatty acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol.

21. A fat or oil processed food comprising a fat or oil composition as claimed in claim 17.

22. An HDL-cholesterol-level elevating agent comprising a fat or oil composition as claimed in claim 17.

23. A method for elevating the HDL cholesterol level in the blood of a patient in need thereof, comprising administering to said patient in need thereof, a fat or oil composition as claimed in claim 17.

24. A method for lowering the activity of PAI-1 in a patient in need thereof, comprising administering to said patient in need thereof, a fat or oil composition as claimed in claim 17.

25. A fat or oil processed food, comprising:

(a) one or more food raw materials;

(b) a fat or oil comprising at least 35 wt% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol; and

(c) phytosterol in an amount of not less than 0.05 wt%, based on total amount of said fat or oil (b).

26. A fat or oil processed food, comprising:

(a) one or more food raw materials;

(b) a fat or oil comprising at least 80 wt% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid)/(an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq$  6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt% based on the constituent fatty acids of said diacylglycerol; and

10 (c) phytosterol in an amount of not less than 0.05 wt%, based on total amount of said fat or oil (b).

ABSTRACT OF THE DISCLOSURE

Described is a fat or oil composition which comprises at least 35 wt% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid)  $\geq 6$ , the usual intake of which as an edible oil makes it possible to reduce arteriosclerotic factors in blood, leading to the prevention of arteriosclerosis, and furthermore, various degenerative diseases.

## WHAT IS CLAIMED IS:

1. A method for activating lipid catabolism in the small intestine epithelium, which comprises administering an effective amount of a diacylglycerol.
2. The method according to claim 1, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.
3. The method according to claim 1 or 2, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.
4. A method for promoting accumulation of fatty acids into the small intestine epithelium, which comprises administering an effective amount of a diacylglycerol.
5. The method according to claim 4, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.
6. The method according to claim 4 or 5, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.
7. A method for inducing expression of a small intestine lipid metabolic gene, which comprises administering an effective amount of a diacylglycerol.
8. The method according to claim 7, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

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<b>Related Pending Application</b>
Related Case Serial No: 10/238,720
Related Case Filing Date: 09/11/02

9. The method according to claim 7 or 8, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

10. A method for suppressing synthesis of a triacylglycerol in the small intestine epithelium, which comprises administering an effective amount of a diacylglycerol.

11. The method according to claim 10, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

12. The method according to claim 10 or 11, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

13. A method for promoting energy consumption, which comprises administering an effective amount of a diacylglycerol.

14. The method according to claim 10, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

15. The method according to claim 13 or 14, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

16. A method for lowering a serum RLP level, which comprises administering an effective amount of a diacylglycerol.

17. The method according to claim 16, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

18. The method according to claim 16 or 17, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

19. A method for lowering a serum leptin level, which comprises administering an effective amount of a diacylglycerol.

20. The method according to claim 19, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

21. The method according to claim 19 or 20, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

22. A method for treating diabetes, which comprises administering an effective amount of a diacylglycerol to a diabetic patient.

23. The method according to claim 22, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise  $\omega$ 3 unsaturated fatty acids.

24. The method according to claim 22 or 23, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

25. A method for improving lipid metabolism in a diabetic, which comprises administering an effective amount of a diacylglycerol to said diabetic patient.

26. The method according to claim 25, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise

ω3 unsaturated fatty acids.

27. The method according to claim 25 or 26, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

28. A method for improving insulin resistance in a diabetic, which comprises administering an effective amount of a diacylglycerol to said diabetic patient.

29. The method according to claim 28, wherein 15 to 90 wt.% of constituent fatty acids of said diacylglycerol comprise ω3 unsaturated fatty acids.

30. The method according to claim 28 or 29, wherein 1,3-diacylglycerols in said diacylglycerol amount to at least 50 wt.% of the whole diacylglycerol.

31. The method according to claim 25, wherein said improvement in lipid metabolism in said diabetic is improvements or an improvement in a triacylglycerol level and/or a cholesterol level in a serum lipoprotein fraction obtained from said diabetic patient.

32. A method of dietary therapy for a diabetic patient, which comprises administering an effective amount of a diacylglycerol.

33. A medical food for a diabetic patient, comprising a diacylglycerol.

34. A processed oil or fat food having insulin resistance improving effect, comprising a diacylglycerol.



#### ABSTRACT OF THE DISCLOSURE

Disclosed are a method for activating lipid metabolism in the small intestine epithelium and also a method for promoting accumulation of fatty acids into the small intestine epithelium, each of which features administering an effective amount of a diacylglycerol. Also disclosed are methods for improving various symptoms in diabetes, which have ingesting a diacylglycerol. Ingestion of the diacylglycerol leads to accumulation of the fatty acids in the small intestine. The fatty acids so accumulated promote induction of  $\beta$ -oxidation, thereby not only activating lipid catabolism but also making it difficult to allow lipids to accumulate as triacylglycerols. This series of actions eventually results in development of lowering action for blood remnant-like lipoprotein level and also lowering action for blood leptin level, and hence, lipid metabolism is improved. Further, energy consumption is enhanced by promoting the induction of  $\beta$ -oxidation and activating lipid catabolism.

FIG 1

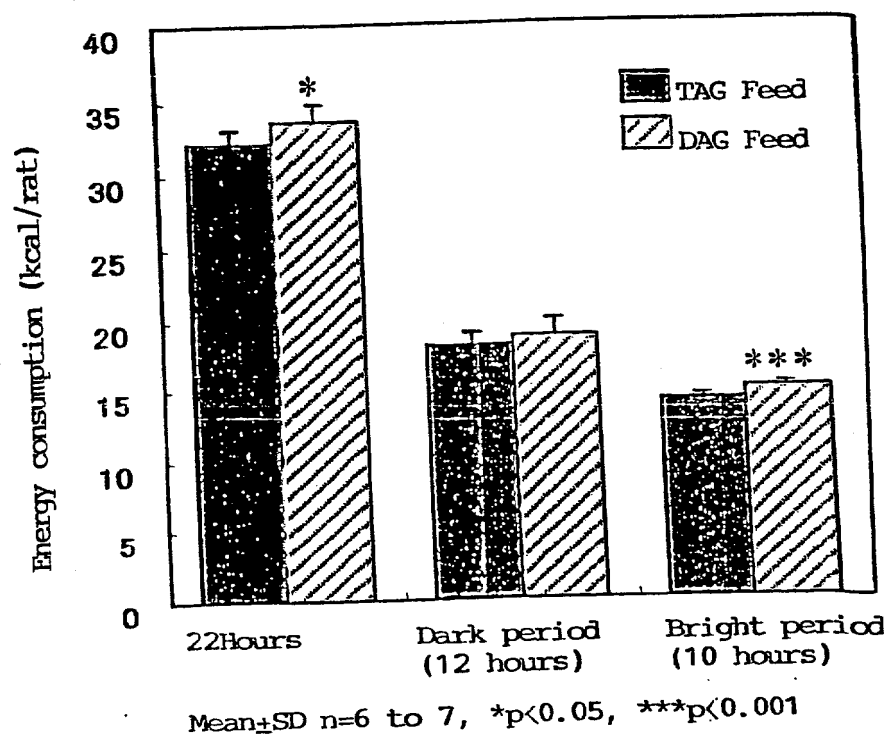
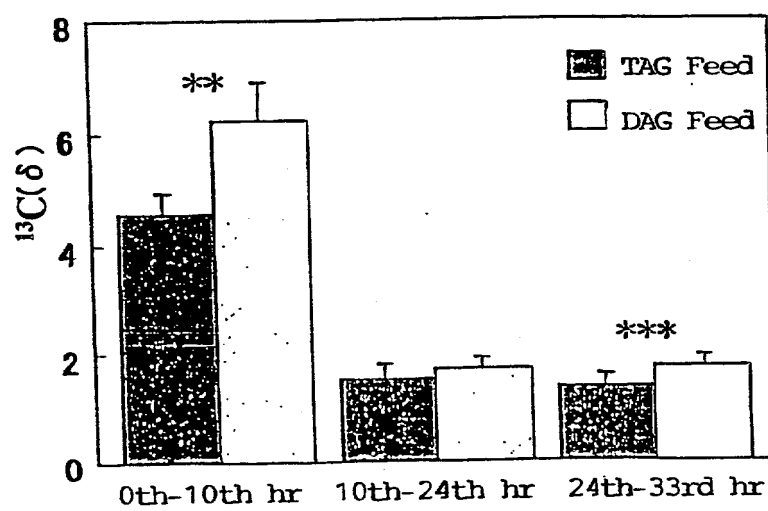


FIG 2



Mean $\pm$ SD, n=8 pergroup

Significance between 2 groups \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$

FIG. 3A

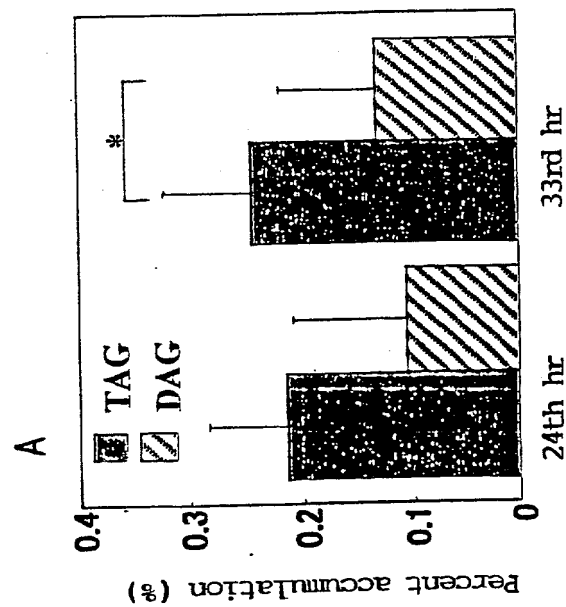
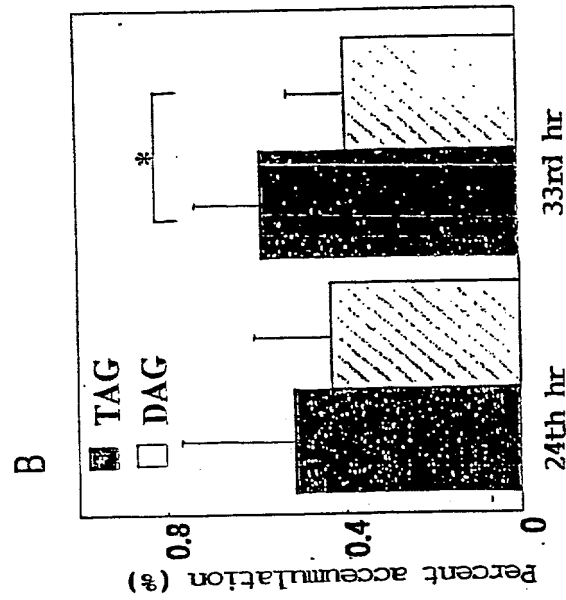


FIG. 3B



\* $p < 0.05$  (significance between 2 groups) (n=6 per group)

\* $p < 0.05$  (significance between 2 groups) (n=6 per group)

FIG. 4

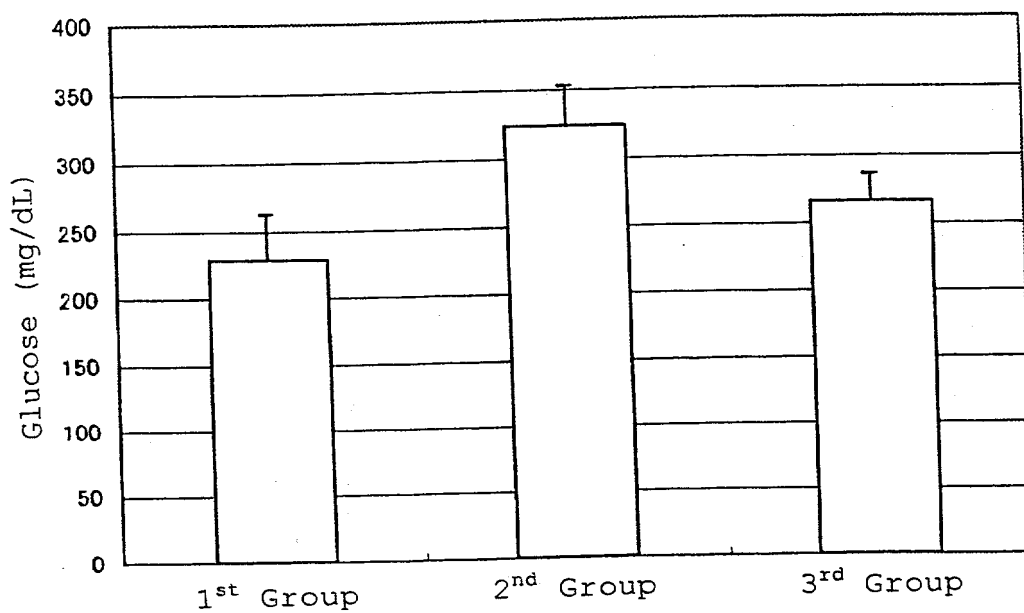


FIG. 5

